Examining the Sensitivity and Specificity of 2 Screening Instruments: Odontogenic or Temporomandibular Disorder Pain?

Barbara Fonseca Alonso, DDS, MS,[*†] *Donald R. Nixdorf, DDS, MS,*[‡§] *Sarah S. Shueb, DDS, MS,*[‡] *Mike T. John, DDS, PhD,*[‡] *Alan S. Law, DDS, PhD,*[‡‖] *and Justin Durham, BDS, PhD*[¶]

Abstract

Introduction: Two groups of patients with orofacial pains that are clinically important to distinguish from each other are patients with odontogenic pain and temporomandibular disorder (TMD) pain. The aim of this study was to determine the sensitivity and specificity of 2 screening instruments in distinguishing between patients with these types of pain. **Methods:** A convenience sample of patients seeking care at an endodontic clinic and an orofacial pain clinic were recruited. The 14-item dental pain questionnaire (DePaQ) was used to screen for odontogenic pain and the 6-item TMD screener was used to screen for TMD pain. Sensitivity and specificity calculations with 95% confidence intervals (CIs) were performed for both instruments, and thresholds/acceptability/performance was assessed using published guidelines. **Results:** Thirty-four patients with odontogenic pain and 37 patients with TMD pain were included in this study. The sensitivity of the DePaQ was 0.85 (95% CI, 0.69–0.95), and specificity was 0.11 (95% CI, 0.03–0.25). The sensitivity of the TMD screener was 0.92 (95% CI, 0.78–0.98), and specificity was 0.59 (95% CI, 0.41–0.75). The point estimates, a single value used to estimate the population parameter, for both the DePaQ and TMD screener were "acceptable" in identifying patients who had the pain condition in question (ie, sensitivity), whereas the point estimate for appropriately identifying patients who did not have the pain condition when they did not have it (ie, specificity) was "nonacceptable" for both. **Conclusions:** The DePaQ and the TMD screener lack diagnostic accuracy for differentiating TMD from odontogenic tooth pain without adjunctive (clinical) investigation(s) or examination. However, the TMD screener has high sensitivity for identifying true positives (ie, TMD pain) and would therefore be useful as a screening instrument when one can definitively exclude odontogenic etiology for pain on clinical and radiographic grounds, for instance in endodontic practices. In this study, the negative predictive value was also high in the TMD screener, and, therefore, we can trust a negative result (ie, when the TMD screener is negative, we can be fairly certain the pain diagnosis is not TMD and rule out TMD). *(J Endod 2017;43:36–45)*

Keywords

Dental pain, dental pain questionnaire, screening instruments, temporomandibular disorders, temporomandibular screener, temporomandibular pain

Significance

The aim of this study was to examine the sensitivity and specificity of 2 screening questionnaires, 1 designed for odontogenic pain (DePaQ) and 1 for TMD-related pain (TMD screener), in patients experiencing pain of either odontogenic or TMD origin.

Tooth pain is the most prevalent pain complaint in the orofacial region, with a 12% prevalence (1). The majority of tooth pain is of odontogenic origin (2) (ie, inflammation in and around the tooth), and this pain is one of the most common reasons patients seek dental care (3–5). The term odontogenic pain encompasses a number of potential diagnoses including symptomatic irreversible pulpitis as a pulpal diagnosis, symptomatic apical periodontitis, and acute apical abscess as an apical diagnosis (6).

A complaint of "tooth" pain may in fact have a nonodontogenic origin as a result of referred pain from other structures. For example, temporomandibular disorders (TMDs) are known to refer pain to the dentoalveolar structures (7, 8). Of the patients who visit the dental office because of "tooth" pain, a sizeable proportion (12%–50%) have a nonodontogenic or mixed origin for their pain (7, 9–11). The most common nonodontogenic reason for "tooth" pain is pain related to a TMD, which arises from muscle of mastication, temporomandibular joints, and/or associated structures (11–13).

Because odontogenic pain is common, it is something dentists are experienced in diagnosing and managing. Occasionally, despite being an odontogenic complaint, tests for dental pathology are negative, and dentists need to consider nonodontogenic reasons for the pain. Having a brief valid screening instrument to aid in identifying the most common nonodontogenic reason for "tooth" pain may be helpful in identifying such patients within regular dental practice. Therefore, the aim of this study was to examine

From the *School of Dentistry, University Complutense of Madrid, Madrid, Spain; †Private Practice, Madrid, Spain; ‡School of Dentistry, University of Minnesota, Minneapolis, Minnesota; §Health Partners Institute of Education and Research, Bloomington, Minnesota; ‖Private Practice, Lake Elmo, Minnesota; and ¶Newcastle University, UK.

Address requests for reprints to Dr. Donald R. Nixdorf, 6-320 Moos Tower, University of Minnesota, 515 Delaware Street SE, Minneapolis, MN 55455. E-mail address: nixdorf@umn.edu

0099-2399/$ - see front matter

http://dx.doi.org/10.1016/j.joen.2016.10.001

the sensitivity and specificity of 2 screening questionnaires, 1 designed for odontogenic pain (the 14-item Dental Pain Questionnaire [DePaQ]) and 1 for TMD-related pain (TMD screener), in patients experiencing pain of either odontogenic or TMD origin. The secondary aim of this study was to explore the performance of the screening questions in subsets of patients whose TMD pain is referred to the dentoalveolar region and presents as "tooth" pain. This assessment was performed to explore whether this subgroup performs differently compared with patients experiencing regular TMD pain.

Methods

This cross-sectional study is derived from data collected within a parent study designed to explore item selection for the development of a persistent dentoalveolar pain disorder screening questionnaire. Ethics approval from the University of Minnesota, Minneapolis, MN, was obtained, and all of the participants provided informed consent before their participation. The Standards for Reporting Diagnostic accuracy studies criteria were used for reporting results (14).

Participants

The recruitment of patients was performed by board-certified orofacial pain practitioners and a board-certified endodontist. TMD pain patients were recruited from the TMD and Orofacial Pain Clinic in the School of Dentistry at the University of Minnesota. Odontogenic pain patients were recruited in a private endodontic practice, The Dental Specialists, within the Twin Cities area. A convenience sample of these 2 groups of patients was collected. Some patients with TMD pain perceived their pain in the jaw and face, whereas others perceived their pain in a tooth/alveolus as referred from other structures. These differences in the 2 subgroups will be covered in greater detail later.

Enrollment Criteria

The following criteria were used to select patients for this study.

Inclusion Criteria. The sample of patients with odontogenic pain were diagnosed with symptomatic irreversible pulpitis, symptomatic apical periodontitis, and/or symptomatic apical abscess following the American Association of Endodontists' diagnostic criteria (15, 16).

The sample of patients with TMD pain were diagnosed with myalgia, myofascial pain with referral, and/or arthralgia following the diagnostic criteria for TMD (DC/TMD) (17). Among the TMD sample, patients presenting with referred pain to surrounding areas (myofascial pain with referral) were accepted. This meant within the TMD pain sample there were 2 subgroups, 1 with referral of pain to the dentoalveolar region as described by Wright (12) and 1 without referral to this region.

TABLE 1. Characteristics of the 71 Patients Enrolled in the Study

Patient characteristics	Patients with odontogenic pain (n = 34)	Patients with TMD pain (n = 37)
	Mean (SD) or % (n)	
Age in years	49 (12)	45 (18)
Sex: female	53 (18)	86 (32)
Ethnicity: non-Hispanic	100 (34)	97 (36)
Race: white	79 (27)	92 (34)
Income ≥$30,000	85 (29)	43 (16)
Dental insurance: yes	94 (32)	81 (30)
Level of education: college degree or more	53 (18)	46 (17)

SD, standard deviation; TMD, temporomandibular disorder.

These subgroups were purposively selected because of the increased potential for diagnostic confusion. Patients included in the sample had to be seeking treatment for their painful condition in 1 of the clinics of the study, 18 years of age or older, and conversant in English.

Exclusion Criteria. Patients were excluded from the study if they presented with both an odontogenic and a TMD pain diagnosis; had another comorbid orofacial pain diagnosis; had a history of traumatic injuries to the orofacial region; had a major systemic illness related to altered pain sensitivity such as rheumatoid arthritis, fibromyalgia, or other widespread bodily pain conditions; had a history of temporomandibular joint surgery or interarticular steroid injection; were unable to give informed consent; or had been involved in a prior qualitative research study to generate questionnaire items for the parent study (18, 19).

Sample Size

The number of patients per pain group was calculated to be 35 per group, and slight over-recruitment was intended to allow for a low expected dropout rate.

Screening Questionnaires Used

DePaQ. The DePaQ (Appendix 1) was used as the instrument to detect patients with odontogenic pain given its widespread use in the literature (20–23). It is a 14-item questionnaire developed in the United Kingdom designed to differentiate 3 groups of odontogenic tooth pain: group A, irreversible pulpitis and acute apical periodontitis; group B, reversible pulpitis and dentin hypersensitivity; and group C, pericoronitis.

The item generation study of this questionnaire was developed within a sample of 313 patients in which just over 50% were male. The sample consisted of group A (35%), B (32%), and C patients (18%). Its original validation study (23) showed a sensitivity (95% confidence interval [CI]) of 80% (71%–87%) for group A, 85% (62%–97%) for group B, and 59% (36%–80%) for group C and a specificity of 83% (69%–93%), 89% (83%–94%), and 90% (84%–95%), respectively.

TMD Screening Questionnaire. The TMD screener (Appendix 2) was developed as a self-report instrument for screening patients for pain-related TMD (24). It was designed in long (6-item) and short (3-item) versions using psychometric methods for item selection and evaluated for validity among 504 participants. It compared pain-related TMD versus healthy controls, versus nonpainful TMD, and versus headaches. Among the results, in all the groups and both questionnaires, the sensitivity was 99%; specificity was 97% in the long version and slightly lower at 95% in the short version. In our study, we focused on assessing the long version, which is expected to perform best, and presented data on the short version for completeness.

Data Management and Statistical Analyses

Data entry was performed by 2 of the participating clinicians and was cross-checked for accuracy by a third investigator. Data were managed using the spreadsheet software Microsoft Excel (Microsoft Excel 2010 for PC; Microsoft Corporation, Redmond, WA), and all analyses were performed using the statistical software package STATA (Stata Statistical Software V12 for Mac; StataCorp LP, College Station, TX).

The data were analyzed comparing all patients with known odontogenic pain with all patients with known TMD pain using the 2 questionnaires. This was contrasted using 2 × 2 tables. Four subgroup analyses were performed depending on the site where the pain was felt. The analyses were as follows: